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Tutorial 01

1. A programming language is a formalized system of syntax and semantics that enables humans to communicate instruction to computers. Programming language are essential for communication between humans and computers.

They provide higher-level abstractions, productivity tools, platform independence, collaboration support and promote innovation, ultimately empowering developers to build complex software systems.



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| Source Code | Machine Code |
| It is easy to read and understanding by human. | It is not easy to read and understating by human. |
| Source code needs to be translated before executed (By using compiler and interpreter) | Machine code is executed directly by computer’s hardware without any translation. |
| It is easy to write complex program. | It is difficult to write complex program. |



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| High-Level Language | Low-Level Language |
| It is easy to read and write for humans. They have keyword, logical constructs and meaningful variable name. | It is not easy to read and write for humans. They have symbols, binary code and mnemonic instructions. |
| High level language provides many libraries, frameworks and tools for developers. | Low level language is typically specific to a particular hardware architecture. |
| A program written using high-level language will run on any device. It is not based on one device. | A program written using low-level language will not run on any device. It is based on one device. |



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| Compiler | Interpreter |
| First analyzes the entire source code. Then it converts into machine code. | It is executing the source code line by line. |
| Generally, faster and more efficient. | Generally, slower and less efficient. |
| Errors and issues are often detected during runtime. | Errors and issues are often detected during interpretation process. |



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| Structured Language | Object Orientated Language |
| It is using control structure like sequences, selection and iteration to execute program. | It is providing mechanisms like classes and objects to structure programs. |
| It is using simple data types like integers, floats, and characters. | It is using complex data structure like properties and functions. |
| It is promoting code reusability through procedural abstraction. | It is promoting code reusability through class inheritance and object composition. |



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| C | C++ |
| C is primarily a procedural programming language. It is focuses on structured programming. | C++ supports multiple programming paradigms. It is focuses on Object Oriented Programming (OOP), procedural programming and generic programming. |
| C has a small standard library that provides essential functions. | C++ has an extensive standard library that includes the functionally of C’s standard library. |
| C is widely used in system programming, embedded systems… | C++ widely used in applications, game developments, GUI applications… |



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| C++ | Java |
| C++ supports multiple programming paradigms. It is focuses on Object Oriented Programming (OOP), procedural programming. | Java is primarily an Object-Oriented Programming language. |
| C++ allows manual memory management with features like pointers. | Java has automatic memory management trough garbage collection. |
| C++ code is compiled into machine-specific binaries, making it less platform-independent. | Java code is compiled into bytecode that runs on the Java Virtual Machine (JVM). |



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| Syntax Error | Logical Error |
| Syntax errors are detected by the compiler or interpreter during the compilation or interpretation process. | Logical errors are do not trigger any error messages during compilation or runtime. |
| Syntax errors result from mistakes in the code’s structure such as missing semicolon, brackets. | Logical error result from incorrect logic. For that case results will be incorrect. |
| It is providing information about the specific line and location. | It is not providing information about the specific line and location. |